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The Cultivated Species of Erythrina

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The genus Erythrina belongs to the Leguminosæ (the Pea or Pulse Family), and contains both trees and shrubs which are indiginous to the tropics or subtropics of both the Old and New World. Their conspicuous red flowers make them interesting horticultural subjects, but because of their tropical origins they are grown chiefly in southern California and in Florida. There has been considerable confusion in the application of names to the cultivated species and it is hoped that this illustrated key, together with the synonyms of these species, will help to identify them and to indicate the correct name for each.

In some instances the best known name of a particular species is not the correct one and is here placed in parentheses beneath the accepted name. Explanation of some of the nomenclatural situations are given in footnotes.

1. Length of banner (the largest petal) 4-6 times the width, banner erect, the two halves folded together to enclose the other petals and fl. parts, (see fig. 38).

   2. Fls. appearing before the lvs., densely crowded on the upper portion of the peduncle; seeds red or brown.

      3. Banner 2-3 times as long as keels; keels auriculate and 3 times as long as wings; lfts. 15-30 cm. long, as broad or broader than long; petioles 15-25 cm. long, 4-10 mm. in diam., tubular (hollow). . . . . 1. E. speciosa Andr. (E. poianthes Brot.)

      3. Banner 5 times as long as keels; keels same length as wings; seeds red; lfts. 5-12 cm. long, usually not quite so broad as long; petioles 7-12 cm. long, 1-2 mm. in diam. not tubular (see fig. 38) . . . . . 2. E. coralloides DC.[1]

[1] Erythrina coralloides has been known in California as E. poianthes. This error may perhaps be traced to a color plate in Curtis' Botanical Magazine (no. 3234, published in 1833) labelled E. poianthes. The plate is an excellent representation of the tree grown in California, and also, surely of E. coralloides, although it apparently has not been assigned to this species. Krukoff, in his revision of the American species of Erythrina (Brittonia 3: 205-337, 1939) referred to this plate in his treatment of E. speciosa [E. poianthes] and did not accept it as representing this species. He, however, did not further identify the plate.

2. Fls. appearing with the lvs., scattered along the upper portion of the peduncle; seeds red.

4. Shrubs, semi-herbaceous, with underground rootstock and basal woody st., which bears peduncles 20-70 cm. long, dies back to the woody stem annually; lfts. long-acuminate. . . . . 3. E. herbacea L.

4. Trees; lfts. ovate, acute to blunt at apex; peduncles 5-25 cm. long.

5. Pedicels about 5 mm. long; peduncles 5-8 cm. long, peduncles, pedicels, and calyces lightly pubescent. . . . . 4. E. americana Mill. [2]

5. Pedicels 5-15 mm. long; peduncles about 26 cm. long; peduncles, pedicels, and calyces densely pubescent with brown hairs. . . . . 5. E. macrophylla DC.

[2]Known in California as E. Corallodendrum, but that species is not known to be cultivated in California.

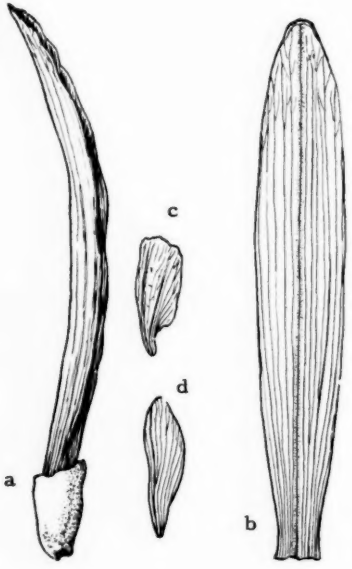

Fig. 38. Erythrina coralloides: a, flower, x 1; b, banner petal, expanded, x1; c, wing petal, x 1 1/2; d, keel petal, x 1/2.

1. Length of banner (the largest petal) 1 1/3 - 3 times the width, banner reflexed or erect.
   6. Calyx spathe-like or 2-lipped; seeds red.
      7. The calyx spathe-like with linear lobes at apex; keel petals separate, ovate; wings curved: small deciduous trees.
         8. Bark of tree thick and corky; leaves heavily tomentose when young, when older the tomentum disappears and leaves become coriaceous; calyx-lobes 6-8 mm. long. . . . . .6. E. latissima E. Meyer[3]
         8. Bark of tree not thick and corky; leaves not coriaceous when mature; calyx-lobes 2-3 mm. long. . . . . .7. E. variegata L. (E. indica Lam.)
      7. The calyx two-lipped, without linear lobes at apex; keel petals united, wings ovate: large nearly evergreen trees.

[3]This plant has been called E. abyssinica Lam. [E. tomentosa R. Br.] in southern California. E. abyssinica, however, is a plant of tropical Africa and differs in several ways from the South African E. latissima.

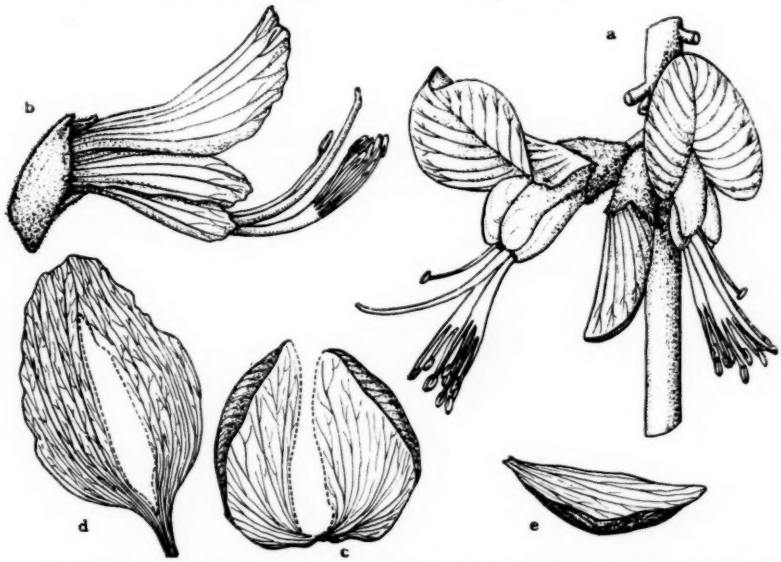

Fig. 39. Erythrina caffra: a, lower portion of inflorescence, showing 2 flowers and a bud, x 1; b, flower, side view, x 1 1/2; c, keel petals, x 1; wing petal, x 1; d, banner petal, x 1.

9. Flowers tending to stand away drom the stem (fig. 39); banner 5-6 cm. long, about 3 cm. wide, expanded and reflexed and not enclosing the other flower parts. . . . . 8. E. caffra Thunberg (E. Constantiana Micheli)

9. Flowers tending to lie against the stem (fig. 40); banner 4-5 cm. long, 1.5 cm. wide, the two halves folded together and enclosing the other flower parts. . . . . 9. E. lysistemon Hutchinson[4] (E. caffra of various authors, not Thunberg)

[4]There has been considerable confusion as to the identity of the true E. caffra. It is now established that E. caffra of Thunberg (who originally described the species) is the plant with the expanded and spreading banner as illustrated here (fig. 2), and that the plant whose flowers have the folded banner (fig. 3) known in the horticultural trade as E. caffra is properly E. lysistemon. [The plant illustrated in Curtis' Botanical Magazine (vol. 50, plate 2431, 1823) as E. caffra is, however, typical E. Humeana.] Before the identity of E. caffra Thunberg was established for the tree grown in southern California, the name E. Constantiana was taken up for this tree. It is now known, however, that E. Constantiana is another and later name (a synonym) for the true E. caffra. For a more complete explanation of the application of these names, see Journ. Calif. Hort. Soc. 14: 107-111, (July) 1953.

Fig. 40. Erythrina lysistemon: a, inflorescence, x 1/4; b, leaf, x 1/4; c, flower, x 1; d, banner petal, expanded, x 1; e, wing petal, x 1; f, keel petal, x 1.

6. Calyx entire, truncate or short toothed at apex; seeds red or black.

10. Banner 1 1/2 - 2 times as long as keels, expanded and reflexed; keels united, 3 times (in E. x Bidwillii 1 1/4 times) as long as wings and 1/2 - 3/4 the length of the banner; seeds black (except perhaps E. x Bidwillii which I have not known to produce fruits or seeds).

11. Inflorescence leafless, 15-30 cm. long, lateral or terminal, often in groups of 2 or more toward the ends of branches. 10. E. falcata Benth.

11. Inflorescence leafy, terminal, 50 or more cm. long, or flowers often in the axils of the leaves.

12. Length of the banner 1 1/2 times its width, banner spreading and reflexed from other flower parts; wings about same length as calyx, 1/3 length of curved keels; stamens enclosed by keels except for exserted anthers. . . . . 11. E. crista-gallii L.

12. Length of banner 2 1/2 times its width, banner not spreading and only slightly reflexed from other flower parts; wing petals about twice as long as calyx and nearly as long as keels, stamens enclosed in lower half by keels, upper half exserted. . . . . 12. E. X Bidwillii Lindley

10. Banner 2 times or more as long as keels, more or less erect; keels united or separate, approximately same length as wings or slightly shorter, and 1/3 or less the length of the banner; seeds red or black.

13. Shrubs; seeds red.

14. Banner red with green tip; peduncles less than 15 cm. long; leaflets 1.5-3.5 cm. long, nearly as broad to as broad as long; pods armed with prickles. . . . . 13. E. acanthocarpa E. Meyer

14. Banner entirely red; peduncles more than 15 cm. long; leaflets 10-30 cm. long; pods without prickles.

15. Dwarf shrub, 0.5 m. tall; leaves and peduncles arising from underground stem at the ground level; leaflets blunt or merely pointed at apex, the terminal ones 10-30 cm. long and 5-25 cm. wide; lower surface of leaflets and petioles armed with prickles. . 14. E. Zeyheri Harvey

15. Shrub, up to 2 m. tall; leaflets tapering and long acuminate at apex, the terminal ones 5-12 cm. long and 3-7 cm. wide; leaflets and petioles without prickles. . . 15a. E. Humeana Spreng. var. raja (Meissn.) Harvey[5]

13. Trees.

16. Keels separate, keels and wings 5-6 mm. long; seeds red. . . . . 15. E. Humeana Spreng. (typical form)

16. Keels united, keels and wings 10-15 mm. long, seeds black. . . . . 16. E. arborescens Roxb.

Finding List of Epithets

As an aid to persons checking identities of cultivated coral-trees the following list of epithets used in this paper, or known to be used in the trade, is included. Underscored names are those accepted as valid and are followed by the sequence number used in the above key. All other names are synonyms and each is followed by the name of the taxon to which it belongs.

abyssinica Hort., not Lam. - E. latissima
acanthocarpa E. Meyer, no. 13
americana Mill., no. 4
x Bidwillii Lindley, no. 12
caffra Hort. not Thunb. - E. lysistemon
caffra Thunb., no. 8
Constantiana Micheli - caffra
Corallodendrum Hort. not Linnaeus - E. americana
coralloides DC., no. 2
crista-gallii L., no. 11
falcata Benth., no. 10
hastifolia Bertol. - E. Humeana var. raja
herbacea L., no. 3
Humeana Sprengel, no. 15
Humeana var. raja (Meissn.) Harvey, no. 15a
indica Lam. - E. variegata
latissima E. Meyer, no. 6
lysistemon Hutchinson, no. 9
macrophylla DC., no. 5
poianthes Brot. - E. speciosa
raja Meissner - E. Humeana var. raja
speciosa Andr., no. 1
tomentosa R. Br. - E. abyssinica Lam. not Hort.
variegata L., no. 7
Zeyheri Harvey, no. 14

[5]Formerly known in California as E. Humeana, where it is cultivated more widely than is the tree form whose leaflets are acute rather than attenuately acuminate. Typical E. Humeana (a small tree) is native in the eastern part of the Cape Province (South Africa) and has been grown for a number of years at the Evans and Reeves nursery [West Los Angeles] and the Huntington Botanical Garden [San Marino] in California. The shrubby var. rajana, native in Natal and Transvaal, is more commonly cultivated in California. For a discussion of these two plants, see Journ. Calif. Hort. Soc. 14: 110-111, 1953.

Ibervillea, a Cucurbit Newly Cultivated in the United States

H. E. Moore, Jr.

The Wild Balsam or Hierba de Vibora, native from Texas to California and northwestern Mexico, is an attractive vine belonging to the cucurbit family and has lately been receiving attention as an ornamental cultivated for its bright fruit. It bears the name Ibervillea Lindheimeri (Gray) Greene and is not listed in Hortus Second, having first been offered in the trade by Rex Pearce, Moorestown, New Jersey in 1942 and later by O. F. Garret, Ysleta, Texas. As long ago as 1853 it was cultivated in France and was described and illustrated by Goualt under the erroneous name Bryonia abyssinica in Revue Horticole for that year. In most manuals and monographs it is listed as Maximowiczia Lindheimeri (Gray) Cogn. and is of interest not only because it is now finding its way into our gardens but because its name provides a problem in nomenclature that merits attention.

The genus Ibervillea consists at present of three to five species of dioecious vines climbing by simple tendrils. The leaves are palmately veined and variously lobed. The small yellow or greenish flowers are borne either singly in the axils of female plants or in axillary racemes or short clusters of one to three in the male plants. They have a more or less cylindrical or bell-shaped hypanthium with five short sepals and five spreading oblong, obovate or linear petals. Those of the male plants bear three sessile stamens with straight anthers at the throat of the hypanthium, those of the female plants lack stamens and have an ovoid ovary, an elongate columnar style with no disk at the base and a three-lobed stigma. The fruit is a small ovoid to globose red or orange berry 2.5-5.0 cm. in diameter with numerous rounded and margined seeds.

In having three distinct stamens with straight anthers, Ibervillea is distinct from most other cultivated cucurbits except Melothria which is used in similar fashion in the southern states. These two genera are similar in habit and are separated on a technical character of the female flowers, there being a disk at the base of the style in Melothria and none in Ibervillea. A more readily discernable

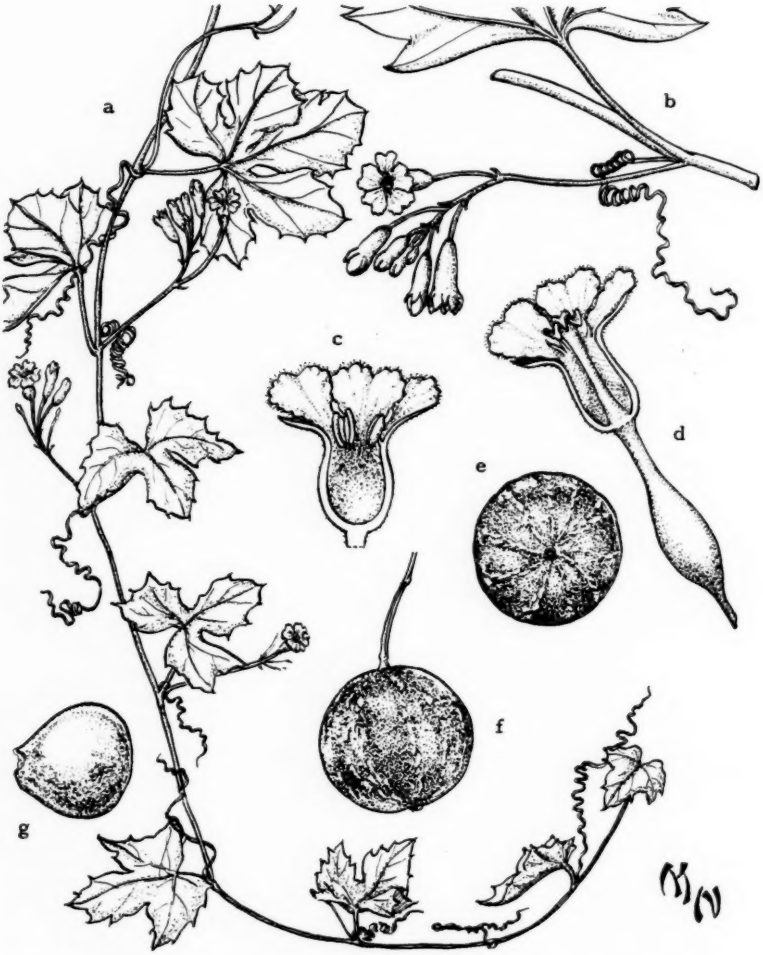

Fig. 41. Ibervillea Lindheimeri: a, terminal portion of vine with flowers, x 1/3; b, stem node and staminate inflorescence, x 3/4; c, staminate flower, vertical section, x 2; d, pistillate flower, perianth half removed, x 2; e, fruit, end view, x 3/4; f, fruit, side view, x 3/4; g, seed, x 3; [b-d, redrawn from Cogniaux].

difference lies in the color of the fruit, that of Ibervillea being red or orange, that of the cultivated Melothrias being greenish or brownish. Ibervillea Lindheimeri, the only species of the genus in cultivation, is distinguished from other species by its racemose male flowers with obtuse petals, its often deeply 3-5-lobed leaves and its minutely apiculate globose orange or red fruit.

This species, Ibervillea Lindheimeri, was first described by Asa Gray in 1850 as a species of a more southern genus, Sicydium, with a variety tenuisecta added in 1852. Ten years later the French botanist Charles Naudin described two additional species, Sicydium tripartitum and S. tenellum. When Alfred Cogniaux, another French botanist, monographed the genera and species of the family Cucurbitaceæ in 1881 he realized that Gray and Naudin had erred in calling their plants species of Sicydium and described a new genus based on these species which he called Maximowiczia in honor of the Russian explorer and botanist Maximowicz.

Cogniaux knew that the name Maximowiczia had been used previously for a few asiatic woody vines in the Magnolia family but since these were generally considered the same as the genus Schisandra he reused the name. According to the International Code of Nomenclature, now the standard guide for the application of names to plants, the same name cannot be used twice even if the first used is no longer accepted, hence a new name was required for these small vines of our southwest.

In 1895 Edward Greene, a student of western plants, proposed the new name Ibervillea. Unfortunately his method of publication was not in strict accordance with rules. He indicated only that a southwestern genus of Cucurbitaceæ went under an untenable name and that he would call it Ibervillea. According to the rules the name of a genus is not validly published unless it is accompanied by (1) a description of the genus or (2) by the citation of a previously and effectively described genus under another name or, (3) by reference to a previously and effectively published description of the genus as a subgenus, section or other subdivision of a genus. Greene conformed to none of these but instead listed the three species he knew with references to their description by Cogniaux under Maximowiczia. This, however, does not constitute proper publication of the genus since the rules state that a taxon is not described simply by listing the included elements, in this instance species. Although not published in good form there is no doubt from the context and synonymy of the species that the name Ibervillea was proposed by Greene to replace Cogniaux's Maximowiczia. In view of the tenuous reasoning that is sometimes accepted for earlier work it seems reasonable to accept the name Ibervillea on the basis of its original publication.

For those who adhere rigorously to the rules and cannot consider the above as valid publication, the genus Ibervillea was accepted by Small in his Flora of the Southeastern United States in 1903 and may be cited as dating from this publication. Here it was adequately des-

cribed and attributed to Greene. Four species were listed, Small having elevated Gray's variety to specific rank as Ibervillea tenuisecta (Gray) Small.

The species of Ibervillea are variously treated. A new study of the genus is much to be desired but until such is available the latest monograph of Cogniaux in Engler and Prantl, Pflanzenreich IV, 275, I: 235 (1916) is followed as to the species but not as to the generic name which there is still retained as Maximowiczia. Persons interested in the synonymy of Ibervillea may consult that reference for detailed bibliography.

Ibervillea Lindheimeri is a vine easily grown in a sunny exposure on a fence or trellis. Seed may be started in pots in the north and the plants set out as soon as late frosts are past. Persons interested in novelties for autumn flower arrangements will find the small globose fruits a welcome addition to the gourd material more commonly available, although the fruit of this Wild-Balsam is somewhat soft and lacks the hard shell of the gourds.

The Bailey Hortorium is reorganizing its system of recording its collection of nursery and seed catalogues, utilizing punched-cards whereby entries may be sorted readily by name of firm, geographic location, type of material handled, etc.

Commencing with the December issue of "Baileya" it is proposed to publish lists of Hortorium holdings of catalogues of American firms (or individuals), and their addresses, that currently are specializing in plants or seeds of particular genera, families, or distinct cultural groups. This will be a continuing series of 1-2 page articles. Readers are invited to send in suggestions of groups they would like to see accounted in the December or March issue. It is expected that such listings will not only be of service to readers, but that omissions in our holdings may be noted and be brought to our attention.

Latin Names and Their Authors

G. H. M. Lawrence

Many works indicate the date of introduction of a plant by placing it parenthetically after the name, making suitable explanation in a too infrequently read Preface. In "Modern Roses IV", known to many American horticulturists, the Latin name is followed by that of the author of the name and then the year of introduction. Recently, after consulting the account of a rose species in "Modern Roses IV", a correspondent inquired how the Lindley "who originated Rosa xanthina could have introduced that species in 1906, since he died in 1865!" He had read "R. xanthina Lindley" and assumed it meant that Lindley had "originated" the species. Others have assumed that the person whose name follows that of a species was the first to describe the species, or the first to discover it, or to introduce it. L. H. Bailey has recounted the anecdote of the society matron who, while gazing at a 60-foot oak in a Florida park, read on its trunk the label, QUERCUS HYBRIDA SMALL", and, not knowing of the botanist, J. K. Small, was head to remark, "My word, how big would it be if it were large?"

To many plantsmen there is little or no significance attached to the name of a person following a Latin name of a plant. For the most part, it is important only to the botanist, or to the person doing critical work with the kinds of plants and their names. However, it does call for explanation. It does have meaning.

Two hundred years ago [in May, 1753] Carolus Linnaeus published his "Species Plantarum," a 2-volume work in which he named and described every species of plant then known to him. This work is accepted as the beginning of modern nomenclature for plants. In order to know the species first named by Linnaeus, his name [or, more commonly its abbreviation, L. or Linn.] follows, as Kalmia latifolia L., for the Mountain-Laurel. This is done to identify Linnaeus as the person who named that species.

Linnaeus did not discover the Mountain-Laurel in the woods of America, nor did he name it from plants in his garden in Uppsala. Peter Kalm collected it in woods of America [it was introduced into cultivation, however, as early as 1734]. Kalm prepared a flowering branch, pressed and dried it, and included it in a bundle of plants brought back to Linnaeus in 1751. With the collections were his notes

containing a description of the shrub. Linnaeus recognized it as a new genus, named it Kalmia, and gave the species its first Latin name, Kalmia latifolia. Linnaeus is the authority for that Latin name. The name is based on a specimen still to be seen in Linnaeus' herbarium.

The significance of authorities for Latin names is illustrated by the case of the pale-yellow-flowered, shrubby, silvery-leaved alyssum, known as Alyssum murale. This species was collected in Greece by Boissier, the great Swiss authority on the flora of eastern Europe and western Asia. In his "Flora Orientalis" [1867] he called it A. argenteum Vitm. assuming it to be the same as the plant so named and described by Vitman in 1790. Vitman's description of his plant is ample and, as shown by the Austrian physician-botanist, Hayek, the two are very different species. That means that the A. argenteum Vitm. is not the same as the plant called A. argenteum by Boiss. The latter name is distinguished as A. argenteum sensu Boiss. [in the sense of Boissier] or more concisely in some works as A. argenteum Boiss. The presence of each author's name is the only concise way of showing this distinction. In botanical writings the situation of the one name for two plants would be condensed to the expression, A. argenteum Boiss. (1867) not Vitm. (1790). Very often the dates are omitted. Because Boissier's plant is different from Vitman's, it is clear that it can not have the same name. A search of the records shows that plants from the same area as Boissier's, and not taxonomically distinct, had been named A. murale by Waldstein and Kitaibel in 1802. This, the oldest name for the plant, displaced A. argenteum of Boissier.

There is more to author citation than is indicated above. For example, in 1818 Thomas Nuttall considered the Oregon-Grape as a genus distinct from the barberries. He called the genus Mahonia. However, before this, many of the species of this alliance had been named and described as species of Berberis. The Oregon-Grape itself was first named Berberis Aquifolium by Frederich Pursh, in 1814. The pressed and dried specimen on which he based the name and description is the type of the species. [These types of species are actual specimens from the plants themselves and have been preserved in the world's herbaria. They are the "hard core" by which on comparison with them, critical identifications are made. Even though some are 200 years old and more, they are consulted regularly in efforts to determine the identity of the plant concerned and to determine its correct name.] Four years after Pursh named the Oregon-Grape, Nuttall in his then monumental "Genera of North American Plants" transferred that species to his new genus Mahonia, calling it Mahonia Aquifolium. As M. Aquifolium, the name was still based on Pursh's type. This is important, because in event of controversy over the identity of a plant of given name, the situation shown by the type specimen may settle the matter.

In these instances involving the transfer of a name from one

genus to another, the author citation is double that of the more simple cases. Here, Berberis Aquifolium Pursh becomes Mahonia Aquifolium (Pursh) Nutt. The presence of a parenthetical author [in this case, Pursh] indicates that the specific name or epithet has been transferred from an earlier genus name. It indicates also that the type for that plant is that of the parenthetical author [Pursh] and not of the combining author [the one who made the new combination of names, in this case, Nuttall].

Instances of double author citation may indicate transfer of a species from one genus to another, as shown above, or may indicate that a species has been reduced to a variety, or that a variety has been raised to a species - these changes in rank all reflecting matters of opinion. For example, Tulipa chrysantha Boiss. is now considered to be only a variety of T. Clusiana DC. [for DeCandolle], an opinion reached by Sealy of Kew, following his study of a much wider range of material than had been available to Boissier. In its new status of variety, its name and full author citation is T. Clusiana DC. var. chrysantha (Boiss.) Sealy. This form of citation shows that Sealy's var. chrysantha is the same plant to which Boissier earlier applied the epithet "chrysantha", and is based on Boissier's type specimen.

The Black Chokeberry, Aronia melanocarpa (Michx.) Elliott was first named and described by Michaux in 1803 as Mespilus arbutifolia var. melanocarpa. Michaux was a French botanist and thought the chokeberries to be closely allied to the medlars, members of the genus Mespilus of Eastern Europe. Willdenow, in 1809, came a little closer and included the chokeberries in Pyrus. Stephen Elliott, in his Sketch of the Botany of South Carolina and Georgia (1821), was the first to recognize them as belonging to the genus Aronia [a genus so named by Medicus in 1879, on the basis of European material]. This is an example of how an author's name [in exchange] is used parenthetically when a name, first given to a variety, is retained when that variety is raised to the rank of species.

Horticulturists are becoming more precise in their thinking. The horticultural literature is certain to include author citations with its Latin names to an increasing extent. They are a necessary part of every horticultural monograph. They were used 50 years ago in Bailey's "Cyclopedia of American Horticulture" and 20 years later in his "Standard Cyclopedia of Horticulture." Rehder used them in his "Manual of Cultivated Trees and Shrubs" as did Bailey in both editions of his "Manual of Cultivated Plants." They were not used in either of the editions of Hortus. When I discussed this omission with L. H. Bailey, he told me that the amateur horticulturists and home-gardeners [for whom Hortus was intended] were not then [1940] ready for the citation of authorities after Latin names. He could have added that the inclusion of authorities for the 32,000 Latin names in Hortus Second would have materially increased the time and cost required to compile that volume. The truth of this

last reason is now evident, because botanical authorities are being included in Hortus III, and the time required to ensure their correctness is lengthening the period of waiting for a new Hortus.

Sending Material to be Identified.

Fragments of plants are received regularly by mail for identification by members of the Bailey Hortorium staff. They are received similarly by botanical gardens and college departments across the country. Most of us on the receiving end are glad to try to identify this material, but the chances of success and the accuracy of the identification will be increased if the sender will observe a few simple rules:

1. Ensure that the specimen is a representative portion of the plant to be identified, that it bears at least one flower (preferably more) and 3-4 leaves. Add a note on size and habit of the plant and color of the flowers.
2. Press the specimen by placing and spreading it between a few sheets of newspaper and leaving it under a heavy book for a day or so before mailing. Reinforce the parcel with cardboard.
3. If more than one unknown is sent at one time, afix a slip of paper to each specimen with a number or letter by which the specimen may be referred in correspondence.

Reasonable success has been experienced when mailing living material (even from Hawaii by air) in sealed pleiofilm bags [used for packaging frozen food]. When so packaged and sealed, no water or moist cotton should be added. The specimen and bag may be sent in a box or flattened and enclosed in an envelope or parcel.

G. H. M. L.

Code of Nomenclature for Cultivated Plants now Available

At the last International Horticultural Congress, in London (1952), a new International Code of Nomenclature for Cultivated Plants was adopted. The Royal Horticultural Society published the code in booklet form, edited by W. T. Stearn, together with a historical account of the subject by Mr. Stearn. Copies have been acquired by the American Horticultural Council, Inc. for sale in the United States. Persons desiring the booklet may obtain it from the Secretary, American Horticultural Council, Inc., Bailey Hortorium, Cornell University, Ithaca, N. Y. Price, 25¢ a copy, postpaid.

Orchids Cultivated in Singapore

Gordon P. DeWolf
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Orchid growers in this country, and in Europe, have devoted much time and energy to the production and cultivation of hybrids in the genus Cattleya and some of its relatives. Until fairly recently, indeed, we in the United States have been comparatively unaware of other groups of orchidaceous plants. True, there have always been a few growers who have handled Paphiopedilums (more commonly, but erroneously, known as Cypripediums) and Cymbidiums, and even some of the "obscure" genera, like Odontoglossum, Dendrobium, and Phalaenopsis, but such growers have been fairly rare. Now-a-days, of course, "Cyps" are becoming somewhat more popular, and growers, on the West Coast at least, are quite enthusiastic about Cymbidiums. We even find, here and there, enthusiasts who are growing some of the so-called "botanical" genera, such as Lycaste, Epidendrum, and Coelogyne.

During the past two decades, and particularly in Hawaii, there has been a sudden growth of interest in certain of the palaeotropical orchids, notably the genera of the Vanda alliance and the genus Dendrobium. Many of these plants have been considered rather difficult to grow in the United States, but even here the growers are finding that the extra effort is amply repaid by the interesting and commercially valuable blooms obtained.

A recent period of study at the University of Malaya, under the auspices of the Fulbright Act, gave me the opportunity of seeing some of these palaeotropical orchids in their native habitat - and also allowed me to find out, at first hand, about the progress of orchid cultivation in that area.

Singapore, a city, an island, and a British Crown Colony, lies less than 90 miles north of the Equator, at the southernmost tip of southeastern Asia. The island is low-lying, the highest hill being somewhat less than 600 feet in elevation, and has a remarkably constant climate. Rainfall averages somewhat less than 2.5 meters (100 inches) per year, and is quite evenly distributed through the months. Temperatures average 85°-90° F. during the day and 70°-75°F. at night. So uniform is this climate that plants imported from areas with more marked seasonal variation have difficulty in adjusting their growth cycles to the new conditions. Indeed, it is

not uncommon to see trees (for instance the mango [Magnifera indica, L.] and the Para rubber [Hevia brasiliensis, Muell. Arg.]) bearing flowers, fruits, and new leaves all on discrete branches of a single individual. Withal, there are small variations in rainfall and temperature that profoundly influence the local vegetation. Certain orchids, as Dendrobium crumenatum Sw. and Bromheadia Findleysoniana Reichb. f., are influenced by relatively small, but sudden drops in temperature, as occur during a sudden rain-storm. Other plants, as the two trees mentioned above, are markedly influenced by short periods of dry, clear, weather.

Such a climate is not conducive to the culture of many of the orchids with which we are most familiar. Some of them, as the labiata group of Cattleya, come from cooler regions, others such as the nobile group of Dendrobium demand a decided dry season. Nonetheless, the orchid flora of Malaya is very rich, comprising about 800 species. Many of these, of course, are either small and/or dingy-flowered, or are plants of the cool hill country, but there are a considerable number that have definite horticultural possibilities. In spite of the possibilities, however, orchid culture in Malaya languished for many years. So recently as 1928, when Mrs. Kathleen Gough published her very useful "A Garden Book for Malaya," there were only about 30 species commonly grown, and only one hybrid!

Fig. 42. Spathoglottis plicata, much reduced.

Beginning in the late '20's, however, a few interested individuals encouraged by the enthusiasm of the then Director of the Botanic Gardens, Singapore, R. E. Holttum (now Professor of Botany at the University of Malaya) began to collect the native species, import exotic species from surrounding areas of similar climate, and to hybridize these (various plants) to create a group of garden orchids "tailor made" for local conditions.

Progress at first was slow, only a few hybrids coming into flower in the 1930's, but within the past few years the number of truly fine plants has increased by leaps and bounds. Now, beside the Botanic Gardens, there are a considerable number of private individuals who produce their own hybrids in considerable quantities, utilizing the asymbiotic culture techniques developed here at Cornell by Dr. Knudson.

Probably the most commonly grown orchids in Singapore are species and hybrids of the genus Spathoglottis. These are terrestrial plants, typically found in open grassy places or open forest, frequently along road cuts. S. plicata, Blume, the commonest local species, ranges from northern Malaya through the Malay Islands to the Philippines and Formosa. The Malayan form of the species has a deformed rostellum and is normally self-fertilized - though Ridley records that the forms found eastward from the Peninsula have a normal rostellum and are normally insect-pollinated. In any event, there are several good forms of this species in cultivation (cl. 'Singapore Giant' is perhaps the best), with flowers larger and more widely opening than the normal wild type. The lavender flowers are borne on a many-flowered raceme, which continues to elongate as the blossoms mature. The peduncle itself is 18 - 24 inches long, which places the flowers well above the foliage. Only a few flowers are open at a time, so that the plants remain in bloom for long periods.

Among the first of the hybrids to bloom in the Singapore Botanic Garden was Spathoglottis X 'Primrose,' a cross between S. plicata Blume and another Malayan species, S. aurea, Lindl. The hybrid is a somewhat smaller plant than S. plicata, but with good-sized, wide-opening flowers, primrose-yellow suffused with pale rose-purple. With this, as with other Spathoglottis hybrids, it has been found that the hybrid plants have a high degree of sterility, so that second generation hybrids have proved difficult to produce. However, patience has overcome this problem to a certain extent, and there are now a number of locally produced hybrids, using these as well as other species, giving a wide range of color variation from white through yellow and red to purple. These plants are commonly grown in pots and brought into the house or porch while in bloom. They also make a fine show planted out in beds in the garden.

While Spathoglottis, as noted above, makes a good bedding or pot plant, the flowers are somewhat too small and short-lived to be really good as a cut flower. For these latter uses the Vanda group has proved admirable. Vanda X 'Miss Joaquim,' a cross between the local Vanda Hookeriana, Reichb. f. and V. teres, Lindl. from Burma and Assam, was made in Singapore in the closing years of the last century. This hybrid flowers relatively freely when planted in the open ground, and is much grown by local florists. Vanda X

Cooperi, which is a back-cross of the 'Miss Joaquim' to V. Hookeriana, produced in some respects a finer flower. This also appeared in a local garden in the early part of the present century.

For many years the Vanda X 'Miss Joaquim,' local species, such as V. Hookeriana and various species of Arachnis, were all of this group that were grown. The hybridization program at the Singapore Botanic Garden has changed all this so that now there is a large group of hybrids in a wide range of colors and shapes to choose from. While Vanda hybrids have been produced here, using both local and exotic species, the really interesting crosses have been made with some of the less well known genera, such as Arachnis and Renanthera.

In the latter years of the 1930's there began to come into flower, in the Botanic Gardens and in the collections of private growers, a truly remarkable group of hybrids. These are crosses made between local vandaceous species and various exotic relatives. These crosses were made, primarily to develop plants that would be vigorous growers and free-flowering under Singapore conditions. Secondarily at first, and later of equal importance, was size, shape, and color of the flowers.

Fig. 43. Vanda teres, much reduced.

At present, one of the commonest of these crosses in Singapore gardens is Arachnis X 'Maggie Oei' (A. Hookeriana var. luteola x A. flos-aeris). This has proved the hybrid parentage of one of the "species" of the genus, A. Maingayi Schlechter. The garden rais-

ed hybrids are, however, much more floriferous than those originating in the wild, Hybrids between Arachnis and Vanda, named Aranda, are easily made and are generally quite good garden plants. The flowers tend to retain the "spidery" shape of the Arachnis parent, combined with the flower color of the Vanda parent. The plants grow easily, as the Arachnis parent, but tend to be less "leggy."

There are a number of hybrids utilizing species of Renanthera as one parent. These tend to retain the strict growth habit of the Renanthera, as well as the habit of inflorescence. There is some variation in flower shape, and generally a "dilution" of the color, some very pleasant pastel red and orange shades arising in this fashion. Arachnis does cross with Phalaenopsis, though I did not see any of these plants in flower. Crosses have also been made between Aerides and Vanda (Aerido-vanda) and between Vanda and Vandopsis (Opsianda). These tend to be rather coarse-growing plants, though with extremely interesting flowers.

The genus Dendrobium is another group of plants with which we here in the United States have little acquaintance. D. phalænopsis, Fitzg., it is true, is reasonably common, as is D. nobile, Lindl. (pronounced nóbile - ee). In Hawaii much more is being done with the genus, the latest catalogues listing a great many hybrids and some species. In Singapore, particular emphasis has been placed on hybrids of the sections Ceratobium (of which D. d'Albertisii, Reichb. f., D. stratiotes, Reichb. f., D. veratrifolium, Lindl., D. undulatum, R. Br., D. Mirabelianum, Gaudin, and D. violaceo-flavescens, J. J. Sm. are representative species) and Phalænanthe (represented by D. bigibbum, Lindl. and D. phalænopsis, Fitzg.). These plants produce spikes of fairly long-lived flowers from the upper portion of the pseudo-bulb. In addition, certain species of the section Ceratobium, notably D. veratrifolium, D. Mirabelianum, and D. violaceo-flavescens, are spectacular plants in their own right, well grown pseudo-bulbs reaching a length of 3-4 meters.

In general, the Indian Dendrobia (Dendrobes) do not do well in Singapore, due to the lack of a resting (dry) season. However, certain of their relatives, notably D. Farmeri Paxt. and D. chrysotoxum Lindl. of section Callista, D. Dearei Reichb. f. of section Nigro-hirsutae, and D. ægle Ridley and D. Pierardii Roxb. of section Pedilonum are quite commonly grown. D. Farmeri, D. chrysotoxum, and D. Dearei, in particular are worth culture anywhere.

A discussion of Malayan orchids would be incomplete without mention of Dendrobium crumenatum, Sw. the Pidgeon Orchid. This member of section Rhopalanthe is common on roadside and orchard trees throughout the Peninsula, and, indeed, all of South-east Asia and the Malay Islands, at low elevations. The ephemeral white flowers are produced in abundance in response to the stimulas sup-

plied by a sudden drop in temperature, usually associated with a storm. Despite the short life of the blooms, this is a very useful species, since the flowers are usually produced in abundance, and recurrently. An old tree, covered with this orchid in full bloom is a sight not soon forgotten.

Three other orchids, commonly met with in Malayan gardens must be mentioned. Grammatophyllum speciosum Blume is frequently cultivated, usually as a semi-terrestrial. This species flowers irregularly in response to relatively prolonged periods of dry weather. Bromheadia Findleysoniana Reichb. f. is a common terrestrial orchid found in open grassy areas throughout the Peninsula. The terminal raceme is much compressed, bearing one flower at a time in response to the stimulas of temperature change, in a manner similar to Dendrobium crumenatum. The white, laelia-shaped, flowers last for less than a day, but like the Dendrobium, are produced at frequent intervals. Arundina bambusæfolia Lindl. (or graminifolia) is another common terrestrial orchid throughout the Peninsula. The small, purplish, cattleya-like flowers are produced freely from a terminal, abbreviated raceme. The flowers, again, are short lived, but produced in succession, so that a single clump is almost always in flower.

A word or two about the methods of culture used in Singapore would perhaps be of interest. Vandas, and allied plants, are generally tied to posts and placed in the full sun. The base of the plant (lower 2 dm.) is heavily mulched with a compost of leafmold and manure. The plants are watered heavily at least once a day. That the plants respond to this treatment is evidenced by the profusion of plump, healthy roots that ramify through the compost, and by the abundance of flowers produced by a single plant. Spathoglottis, Arundina,

Fig. 44. Renanthera coccinea [from Bailey, Standard Cyclopedia of Horticulture].

and Bromheadia are planted in a similar compost and given similar treatment.

For pot culture, a mixture of "burnt earth" (broken brick would be our equivalent) and compost may be used - the one for drainage and aeration, the other for nutriment. Epiphytes, if they are potted at all, are usually placed in pure burnt earth and fed with liquid manure. More frequently, epiphytes are tied to a block of wood, with a bit of fern root, and hung in a slat house. These, too, are fed with liquid manure. Under Singapore conditions there is no doubt that manuring is extremely beneficial to all classes of orchids.

Everyone who grows orchids knows that he must work out his own methods of culture for his own conditions. Growers in different areas tend to grow different classes of orchids, depending on their local climatic conditions - and on their own personal tastes.

Fig. 45. Dendrobium superbiens [from Bailey, Standard Cyclopedia of Horticulture].

It is to be hoped that in the future there may be more contact between growers in different corners of the World, and a greater interchange of plants. In the present instance, the growers in Hawaii have much in common with the growers in Singapore. In this day and age of rapid transportation we suspect that an interchange of plants and experiences between growers in th se two areas would be of mutual advantage.

Gynandriris, a valid genus of Iridaceæ

G. H. M. Lawrence

In 1753 Linnaeus named and described as a corm-producing species of Iris, I. Sisyrinchium. In a recent paper I treated this as the only species of a new subgenus in Iris [subgen. Gynandriris, in Gentes Herbarum 8: 366, 1953], and in so doing I overlooked completely the very excellent account of the species (under the generic heading Helixyra) by Dr. Robert C. Foster in Contributions of the Gray Herbarium 114: 38-41, 1936. This oversight was unfortunate, for Dr. Foster there presented a detailed analysis of the nomenclature of the species and discussed its taxonomy. This publication from the Gray Herbarium, at Harvard University, is not readily available to most horticulturists or Iris specialists, and for this reason a summary of the situation is presented below.

The plant known as Iris Sisyrinchium (illustrated in fig. 46) is characterized in part by-

1. Rootstock a corm, covered by a fibrous tunic;
2. The leaves linear and, unlike most Iris species, not equitant (folded over and enveloping one another at their bases);
3. The spathes thinly membranous (at flowering time) and the veins well separated with thin semi-translucent papery tissue connecting them [in Iris the veins are often reticulate and colorless to greenish-brown, often with colorless papery margins];
4. Ovary and capsule very thin-walled, the wall of the capsule papery in texture, and the capsule enclosed by the spathes at maturity;
5. .The ovary projected into a long-attenuated neck resembling a perianth-tube, but is neither that structure nor is it the style [Dr. Foster advises me that a short neck is sometimes found in Moræa edulis, but that this is due to incomplete fertilization, since fully fertilized capsules do not show the neck];
6. The perianth-tube absent or the segments united just enough to permit the flower to fall as a unit [a distinct perianth-tube is present in Iris species];
7. The filaments more or less adherent to the style-branches and often coherent to one another by their edges, and sometimes the filaments free or nearly so.

It has been pointed out to me by Dr. Foster that some of the above characters (but never all of them) are found in some species of Iris. In a communication from him he has stated:

> "Scarious spathes are found in I. pallida, for example, but they are not veined in the peculiar manner of so many of the species of Gynandriris. In some species of Iris, the perianth-tube is very nearly obsolete, but I can think of none where the tepals are merely basally attached so that the flower falls as a unit in age. Nonequitant leaves are found in many of the Junos [Iris subgen. Scorpiris, cf. Baileya p. 34, a taxon believed by Foster to be a distinct genus]. .... The adherence of the filaments to the style-arms and to one another is a variable character, according to Sir Michal Foster, nonetheless it exists and is most unirislike." ....In other words, despite the occasional appearance or quasi-appearance of some of these characters in scattered and often remotely related species of Iris, it is only in this group which is segregated as Gynandriris that they occur together."

The primarily African genus Moræa is allied to Iris, the two having in common the petaloid style branches that overtop the stamens, and the transverse stigma on the lower side of each style-branch. Moræa differs from Iris in having the rootstock a corm, the stamens monadelphous, and in the absence of a distinct perianth-tube. It is easy to understand why Iris Sisyrinchium was placed in Moræa by John Bellenden Ker in September 1804 [not 1805, as sometimes credited]. The genus Gynandriris was named and described by the Italian botanist Parlatore in 1854 and it was he who transferred Linnaeus' species at that time [making it the type of his new genus] and who made the new combination Gynandriris Sisyrinchium (L.) Parl. About 12 species of Moræa have characters in common with Iris Sisyrinchium and all have been transferred by Foster to Gynandriris. The two genera, Moræa and Gynandriris, may be separated by the following distinguishing characters (kindly provided by Dr. Foster):

Gynandriris	Moræa
Corm-tunics of soft parallel fibers, at least in the inner coats;	Tunics of coarse woody or wiry fibres;
Ovary apically elongated;	Ovary not apically elongated;
Capsule enclosed by spathes at fruit maturity;	Capsule exserted from the spathes;
Spathes colorless, thin-membranous.	Spathes at least partly green, not thin-membranous.

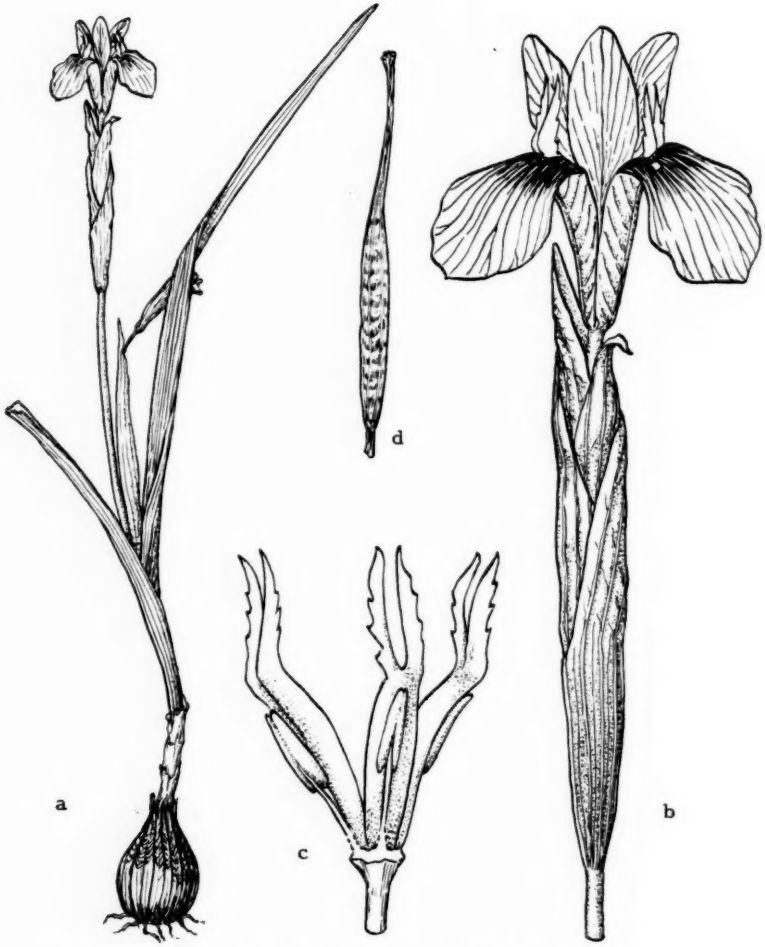


Fig. 46. Gynandriris Sisyrinchium: a, habit of plant incl. bulb, x 1/2; b, inflorescence, showing one flower, its spathes and spathes of lower flowers that have fallen, x 1 1/2; c, flower less perianth, x 3; d, capsule, x 1 1/2.

For many years the illegitimate generic name Helixyra was used for the plants now called Gynandriris. This name [Helixyra] given the genus by Salisbury in 1812, has no botanical standing because Salisbury provided neither a description to accompany the name nor did he include any species with that name [except the illegitimately renamed Helixyra flava, which was a renaming of the plant already named Moræa longiflora by Ker and which Foster transferred to Gynandriris as G. longiflora (Ker) R. C. Foster]. Helixyra is a naked name, a nomen nudum. Actually, after Salisbury's time [as explained in a communication from Foster], "the name Helixyra was used at the subgeneric level, usually with a description, so that it was a valid name in that category. It was not used on the generic level until after N. E. Brown [of Kew, England] validated it with a description in 1929. Of course, even so, it remains a synonym of Gynandriris. Helixyra now is validly published as a generic name, but is illegitimate because it was superfluous when published [another name, Gynandriris, already existed for the genus and had priority]." When names of species in Helixyra appear in contemporary literature, they should be treated as synonyms of Gynandriris.

Gynandriris Sisyrinchium is a native of the Mediterranean, extending from the shores of southern France, through similar coastal habitats of Italy, through much of Greece and its insular areas into the Levant and Asia Minor, Egypt and westward to Morrocco. In general it is a plant of arid or semi-arid areas and of regions characterized by hot dry summers when the plants are dormant. It flowers in its native regions from early March to mid-May. The flowers are blue with darker veins, and are nearly 4 centimeters across.

It has been cultivated by Iris specialists for a century or more and during the last 15 years has been offered by at least a dozen foreign sources and 7 American firms. Since the last War, bulbs have been available from the firm of Van Tubergen (Haarlem, Netherlands) and in this country from Oak Grove Greenhouses (Tuskegee, Alabama), and Lloyd Austin's Rainbow Hybridizing Gardens, (Placerville, California).

A new book just received in the Hortorium library is Miss Christabel Beck's "Fritillaries; a gardener's introduction to the genus Fritillaria", [published by Faber & Faber, London, 96 pp., 1953]. In the preparation of this horticultural monograph, Miss Beck has profited from guidance and counsel of Dr. W. B. Turrill, who is probably the leading botanical authority on the taxonomy of the genus, and the book reflects a thorough knowledge of the cultural requirements and characteristics of the species and varieties. For the benefit of persons interested in breeding fritillaries, there is a chapter by L. F. LaCour on chromosome numbers in the genus.

Hypocyrta Nummularia, A Recent Introduction

H. E. Moore, Jr.

One of the more recently introduced gesneriads is Hypocyrta Nummularia Hanst., a small trailing and rooting epiphytic vine, native in forests of the warm moist regions of Costa Rica north to southern Mexico. It is one of about ten species in a genus that is predominantly Brazilian in distribution and was listed by Rex D. Pearce, Moorestown, N. J. in 1948 and by Fantastic Gardens, South Miami, Florida in 1952 and 1953.

The genus Hypocyrta (hypo-sir-ta) is related to Columnea and like that genus consists mostly of trailing or climbing, somewhat fleshy, usually hairy small shrubs or vines having fibrous roots, axillary flowers with a superior ovary, a solitary gland at the back of the ovary (fig. 47e) and four stamens with the anthers clinging together at the time of flowering (fig. 47d). The distinctive character of the genus is found in the peculiar pouch-like corolla-tube (fig. 47a).

An old generic name for Moneywort (Lysimachia Nummularia L.) is the source of the specific epithet Nummularia (num-mew-lare-ee-a) which was taken from the Latin nummus (a coin) in reference to the shape of the leaves. Because it is a generic name used in apposition it may be capitalized under the Code of Nomenclature as it now stands and in this way gives some indication of the history and origin of the name.

For the plant fancier with a small greenhouse or home conditions where the temperature can be kept above 60°F. and the humidity rather high Hypocyrta Nummularia will make an attractive hanging plant. It does best in half shade and will stand twice as much light as Saintpaulia. In the Conservatory at Cornell it receives the same treatment as species of Episcia being set in a mixture of fibrous loam and peat in equal proportions surrounded by osmunda fiber in a small wire or wooden slat basket hung from a beam. R. G. Wilson of Fantastic Gardens recommends a mixture of shredded osmunda with a smaller proportion of leafmold and it has been noted in Ithaca that plants grow luxuriantly in osmunda alone.

The slender stems of this species are compact with short internodes and thickish lateral branches crowded with broadly ovate to nearly orbicular or obovate shortly petiolate leaves 1.8-6.4 cm.

long and 0.2-3.0 cm. wide. The blades are green and hairy above, slightly paler below and often with a reddish cast along the toothed margins. When well grown the stems effectively conceal much of the supporting basket and are dotted with bright flowers that are borne singly on short pedicels in the leaf-axils. The linear green or sometimes red-tipped calyx-lobes are 5-8 mm. long and contrast with the bright vermillion or scarlet corolla-tube. The latter is 1.8-2.0 cm. long, inflated in a sac 1.2 cm. deep and abruptly narrowed to a blue-violet tinged neck and very small spreading yellow lobes about 2 mm. long. Even in bud the flowers are attractive for the red buttons tipped with the unfolded yellow lobes make bright spots among the foliage.

Although the plants are said to be dormant in mid-summer in Florida the specimens at Ithaca have flowered almost continuously

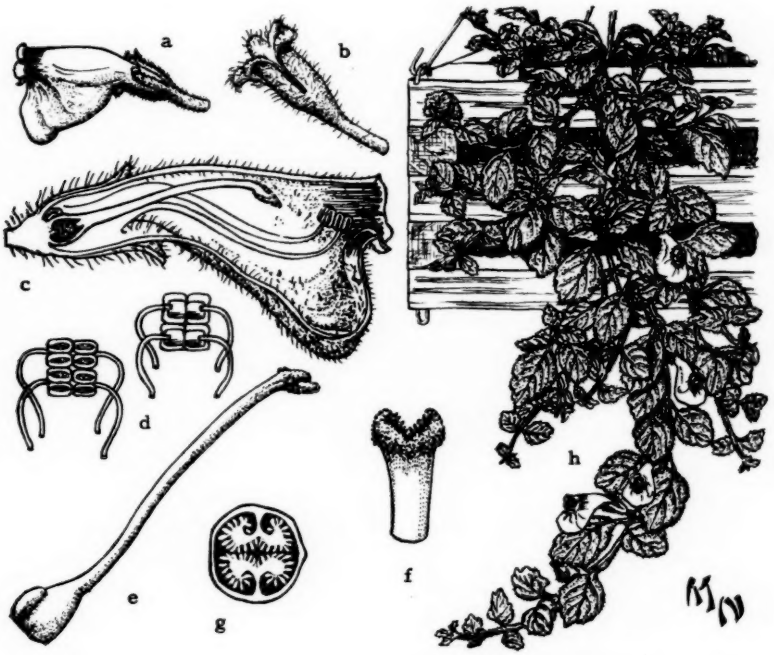


Fig. 47. Hypocyrta Nummularia: a, flower, x 1; b, calyx, x 15; c, flower, vertical section, x 2; d, anthers, ventral and dorsal views, x 4; e, gynoecium and disk-gland, x 4; f, stigma, x 6; g, ovary, cross-section, x 8; h, habit, x 1/3.

since mid-June and have maintained their foliage at all times when not in flower. Apparently the species responds differently to varying conditions and its behavior can be ascertained only through trial in various regions. Attempts to produce fruit on cultivated plants have not been successful in Ithaca but lateral branches root readily in moist sand and the species is easily propagated.

With its novel flowers and compact habit Hypocyrta Nummularia makes a welcome addition to the ever increasing list of gesneriads cultivated in the United States and will delight those who specialize in growing members of the Gesneriaceæ.

THE GARDEN OF BELLFLOWERS by L. H. Bailey, is due off the press by mid-October. This, Dr. Bailey's last book, was written for the most part before and during the last war. At that time he grew a majority of the kinds treated in the book, and engaged the services of Mrs. Elizabeth Burckmyer for the preparation of the 50 full page black and white plates and a full-color frontispiece.

The work contains an introduction prepared by The Macmillan Company, in recognition of an uninterrupted span of 60 years of publishing relations between that firm and Dr. Bailey - a record not known to have been held by any other American author. During this period Dr. Bailey published 76 titles of works of his own authorship, not including as many more authored by others and edited by him.

Dr. Bailey has interpreted the Bellflowers liberally, for while all recognize the Campanulas as being the most conspicuous genus of the group, he has accounted also for the cultivated species of such genera as Adenophora, Canarina, Codonopsis, Cyananthus, Edraianthus, Michauxia, Ostrowskia, Platycodon, Specularia, Symphyandra, and Wahlenbergia. In addition to the key to the genera, there are also keys to the species and descriptions of each, together with cultural notes and information about origins and native habitats.

"The Garden of Bellflowers" is designed as a companion-volume to the three similar previous works by Dr. Bailey: "The Garden of Gourds" (1937), "The Garden of Pinks" (1938), and "The Garden of Larkspurs" (1939). Of these, only "The Garden of Gourds" remains in print. The books represent a departure from other garden books in their illustrative style and in the mode of presenting the subject matter; authoritative, somewhat botanical, but with a continuity and character stemming from the author's personalized style and command of English.

The R. H. S. Dictionary of Gardening - A Review*

G. H. M. Lawrence

A 4-volume encyclopedic work devoted to horticulture is a production of prodigious effort on the part of editor, contributors, proof-readers, and publisher. By all criteria it should be a monumental work. The volumes under review, sponsored by the world's largest horticultural society, and coming from a nation where excellent gardening is a well earned heritage, were long awaited and were expected to be near the epitomy of modernity and correctness. During the last six months of completing copy and reading proof for this work, I was in England working at the R. H. S. Lindley Library, Kew, and the British Museum of Natural History. As a result, a rather penetrating insight was had of the background and work represented by this dictionary.

The background of this dictionary, presented in part in its Preface, deserves summarization. It is a modern version of George Nicholson's "Illustrated Dictionary of Gardening" (1884-1888). In 1938 the R. H. S. appointed Fred Chittenden, its editor of publications, and previously Director of its trial and display gardens at Wisley, as Editor-in-Chief of the new project. Apparently he was given unrestricted freedom to administer the project. In 1939 Chittenden retired from the London area to a cottage in Dedham (about 60 miles from London). World War II was on and travel restrictions were in effect, and his editorial work on the dictionary was done in Dedham. Chittenden, not a wealthy man, did not possess an extensive horticultural or botanical library. It is known that during these war years, and following them, he did not devote appreciable periods of study at the great botanical and horticultural libraries of Britain, nor did he borrow any abundance of titles from them. It is known also that he did not have any comprehensive index or catalogue of pertinent papers in the world's vast periodical literature.

As editor, however he did secure the services of a very few horticulturists to assist in preparing articles in their spheres of specialty. These, among others, included the late W. J. Bean (British authority on cultivated temperate woody plants), the late E. C. Cooper (a commercial orchid grower), Mrs. Vera Higgins

*Chittenden, F. J. [ed.] The Royal Horticultural Society Dictionary of Gardening: a practical and scientific encyclopedia of horticulture. 4 vols. 2316 pp. Oxford University Press, Oxford, England, 1951. $55.00.

(writer on succulents), F. G. Preston, then at the Cambridge Botanic Garden, and the late Dr. Fred Stoker (a leader in the Alpine Garden Society). Excellent articles on entomological and on phytopathological subjects were prepared by the late G. Fox-Wilson and by D. E. Green respectively. In this connection, it is significant to note that the editor did not draw on services of the botanists at Kew, the British Museum (Natural History), or at Edinburgh, nor of specialists elsewhere in the United Kingdom or beyond.

Mr. Chittenden died August 1, 1950 [he was born in 1873]. Officials from the R. H. S. brought to London the records and unfinished manuscript left by the late editor. It was found that essentially all the material for volumes 1 and 2 (up to the letter "L") had gone through final printing and that the signatures were ready for binding! Much of the copy for volume 3 was in page proof (letters L-So), and that for volume 4 (at least through the letter T) was in galley proof, although that for whole sections had been omitted.

The final editing of the book was placed in the hands of Patrick Synge, editor for R. H. S. publications, the task of revising and completing numerous articles from L-Z being taken over by W. T. Stearn, then librarian at the R. H. S. Lindley Library. Extreme urgency was placed on these editors to complete the dictionary in the shortest possible time. Obviously, no changes could be made in copy already printed and in signatures. Corrections of copy then in plate forms were costly to effect and were restricted only to top-priority items. Corrections, revisions, and even complete rewrites of articles then in galley proof (for letters So-onward, as well as the addition of articles on overlooked matters) were made more freely, and at considerable added expense to the Society. Immediately on receiving his new duties, Mr. Stearn enlisted assistance from competent specialists in Britain - horticulturists and botanists - and sent proofs on some difficult genera (as Oenothera and Verbena) to specialists in America. Concurrently, he devoted considerable time and energy to revision of a large number of the articles; checking specimens, consulting types, adding keys, and bringing existing accounts into harmony with modern knowledge, in an effort to make the second two volumes, and more especially the fourth, as accurate and up-to-date as time and facilities permitted. The last forms of the final volume were closed in March 1951. All four volumes were published simultaneously, and not in parts [as was the Nicholson "Dictionary"], in the Spring of 1952.

With this historical background in mind, one may appreciate more adequately what one receives for an investment of about $40. The work is more of a dictionary than an encyclopedia. All entries are alphabetical and include descriptions of cultivated plant families [even those of bryophytes, fungi, and the Characeæ], genera, species, and variants. Common names of these [in the British vernacular] are given freely. The cross-indexing is fair but often frustrating. There are entries under common scientific names of patho-

gens and of insects of garden importance, cultural accounts from a gardening standpoint for all major ornamentals [commercial practices omitted], insertions in proper alphabetic sequence of miscellaneous items concerned with gardening, such as the many types of tools, equipment, materials, and even the chemical elements and their compounds. Not excepted are accounts of such topics as Annual Rings, Bowling Green, Diastase, Knaur, Night-soil, Rabbits, Tanners Waste, and Wind-fall. A rather complete glossary of horticultural, botanical [including mycological], and entomological terminology is scattered through the work. A feature not found elsewhere in any one book is the series of brief biographical entries of the name of many persons for whom an included plant is named [as a generic or specific name]. Derivation of generic names is given for every genus when known.

The scope of the work is vast. It sets out to include the name of every plant ever known to have been cultivated in Britain, even if only at the great botanic gardens of Kew and Edinburgh. It does not include plants grown solely as forage, or field crops, nor all plants grown solely for their economic importance. In essence, it is a dictionary of ornamentals. At the end of the description of each species is given parenthetically a reference to an illustration, when known. An asterisk follows many species names which means that and except for special lists, in the editor's opinion the species is "of special merit." The English system of measurement is used. The country of nativity, or more often only the continent, is given for each species, together with year of introduction. This last feature is somewhat ambiguous, for no mention is made as to where the introduction occurred on that date. Persons assuming universally that this date means introduction to Great Britain will find, on search, that the dates may not be in accord with those in other standard reference works.

This review is more of the treatments of families, genera, and species, than of other articles of the book. They comprise the bulk of the text. The subtitle would lead one to expect the work to be somewhat of an encyclopedia (certainly its scope is encyclopedic) and Americans familiar with Bailey's "Standard Cyclopedia of Horticulture" would expect to find keys to aid in the identification of included plants.

No key was provided for the 239 families treated. There is none by which genera can be identified. By these omissions the work loses much potential usefulness for no one, not even a master, can identify all the included genera (or even families!) on sight.

My count of the plant genera described sets the total at 3,983. Of this number (and excluding fungi and bryophytes), 1,372 are represented by a single species, 608 by two, and 310 by three species. Only 349 generic treatments are accompanied by keys to the included species; 17 of these are of three and 44 are of four species each. All others are of five or more species. It is significant to note that of genera of 4-14 included species, there are 672 unaccompanied by a

key; of genera of 15 or more species there are 272 lacking a key to those species. The number of large genera lacking keys is a major deficiency of the work, if it is to be expected to be of use as an aid to identification. Most discouraging is the discovery that no keys were provided for any of the orchids [e.g., Coelogyne with 81, Cypripedium with 93, and Dendrobium with 217 binomials]; none for any of the succulents, where most of the descriptions of genera of Cacti and Aizoaceæ are inadequate to provide means of identification; none to any of the ferns, and many of these genera are represented by 50 and more included species; few for genera of Liliaceæ [e.g., none for Allium, Eremurus, Fritillaria, Lilium, Muscari, Scilla]; none for the many genera of Gesneriaceæ or Araceæ; and few for those of Caryophyllaceæ [91 binomials under Dianthus but no key], Ranunculaceæ [none for such common genera as Aconitum, Aquilegia, Ranunculus, Trollius], Leguminosæ [none for Astragalus, Bauhinia, Cassia, Lathyrus, Lupinus, et al.], Compositæ [none for Artemisia, Aster 107 binomials, Centaurea, Chrysanthemum, Coreopsis, Erigeron, Helichrysum, Senecio, et al.] and Palmæ, Cucurbitaceæ, Bromeliaceæ, Rubiaceæ, Begoniaceæ, Acanthaceæ, Asclepiadaceæ, Scrophulariaceæ, Gentianaceæ, Myrtaceæ, Euphorbiaceæ, et al. Some apparent keys leave much to be desired: there is none to the series of Rhododendron or to the sections of Saxifraga. That with Erica is only to the "hardy species"; one wonders what is hardy, and where? Those for Calathea, Campanula, and Juniperus are, for the most part, to groups of species and are of little aid for purposes of identification.

On the credit side, a majority of the articles authored by W. J. Bean on temperate woody plants are accompanied by keys. Many of those by F. G. Preston and by Fred Stoker have keys. Very excellent keys are to be found in volume 4, especially to such difficult genera as Solidago, Thalictrum, Thymus, Veronica, Viola and Watsonia, mostly the work of W. T. Stearn. The account, and key to the included species of Primula is excellent. Here, as in many of the treatments of genera in volume 4, Mr. Stearn has added bibliographic references to recent monographs and revisions to which the reader may refer for further details, and on which the account in question has been based or at least consulted. The absence of these aids to identification over much of the work render more correct for it the title of "Dictionary" and make less valid any claim to its being an encyclopedia. There seems to have been no editorial policy on this subject by Editor Chittenden, otherwise more of the treatments of tropical, subtropical, and herbaceous genera would have included keys. The omission indicates also that these articles were written largely or wholly from the literature, that herbarium specimens were not consulted when drafting species descriptions, and that critical or "key" characters did not become an essential part of each species or genus description.

In general, the family concepts and limits are those of Engler

and Prantl. The conifers were treated as composed of two families: Taxaceæ and Pinaceæ, a view long since rejected by most taxonomists and by Engler and Diels' latest revision (1936). Under Stearn's influence, Welwitschiaceæ was treated more correctly as a family, but in an earlier volume Chittenden followed the Benthamian view that Ephedra, Gnetum and Welwitschia were members of a single family. The fern genera follow conventional conservative views [Dicksoniaceæ was not recognized, the genera retained in Cyatheaceæ]. When defining "Family" the editor stated: "The names of families always terminate in -aceæ, except Compositæ, Labiatæ, and Gramineæ." The five other family names that also are exceptions were rejected or omitted. Later, a natural order was described in part as "a family, a group of 1 or more genera." This concept went out of botanical thinking with the turn of the century.

Generic concepts are reasonable and mostly conservative. Not a few are contrary to American usage and not all are conservative. For example, Parsnip and Dill were placed in Peucedanum [Pastinaca and Foeniculum are the genera recognized in America]; Brodiæa was treated ultra-conservatively, a concept revised by Stearn in his treatment of Triteleia; Chiastophyllum (Crassulaceæ) was accepted as a valid genus [here included in Cotyledon]; the respected work of Airy-Shaw, formerly of Kew, wherein he submerged Chiogenes in Gaultheria (Ericaceæ) was ignored; Bryophyllum was retained as a distinct genus [here merged with Kalanchoe of Crassulaceæ]; Hebe was not recognized as genus distinct from Veronica; species of Weigela were treated under Diervilla [the distinction and validity of Weigela was recognized by Stearn in volume 4]; Sinapsis was treated as generically distinct from Brassica, and Horseradish was included under Cochlearia. Elodea densa [now placed in the genus Egeria] is retained in Elodea, while E. crispa should (by most recent treatments) have been treated as Lagarosiphon major. Our American elodea, following current practice, is segregated as Anacharis canadensis.

Criticism has been made by others on the absence of botanical authorities after the Latin names of species. If this was an encyclopedia or a manual, this criticism would indeed be most serious. Except for some treatments in volume 4 (e.g., in Theodora, Torenia, Veronica) authorities are not given for binomials or generic names. The editor truthfully might have said, "Neither were they employed in Nicholson's 'Dictionary'!" This omission renders the treatments less usable, less reliable, and it is not possible to determine, in many cases, the taxonomic correctness of a given name or point of view. A most important reason for including authorities is to obviate confusion due to homonyms or misapplied names. The value of the Dictionary, and its circulation, would have been far greater - at least in this country - if authorities had been added to Latin names.

In a work covering about 4,000 genera [roughly 1,300 more than in Hortus Second and 800 more than in Bailey's Standard Cyclopedia]

it is surprising to find about 250 genera omitted that are grown in America. No critical analysis has been made in this regard, but for the letter "A" only the following genera (grown here) are omitted [nor are their cultivated species known to be included elsewhere by Chittenden]:

Acanthocalycium	Allophyton	Anemarrhena
Aceranthus	Alniphyllum	Arabidopsis
Adonidia	Amianthium	Arthropodium
Adoxa	Ampelodesma	Ascarina
Æglopsis	Amphicarpa	Ascotania
Allionia	Anapalina	

It is also surprising to find some economic plants (as rubber and coffee) included, but others (as most of the cereals, Zea Mays excepted) omitted or only mentioned. Gossypium, the cotton, is treated with only a single species [yet 12 binomials are accounted in Hortus Second]; Galium species specifically are not recommended for cultivation [9 species currently are offered the American trade as ornamentals]; Ilex rotunda, introduced to England in 1850 is omitted, as are many other species introduced there and now widely cultivated here [Chittenden treated 29 species of Centaurea, whereas 61 are in the American trade]. Our commonly cultivated Chinese Evergreen, Aglaonema simplex of Araceæ, is treated under the name A. acutispathum. Except for volume 4, the number of species credited to a genus in each generic treatment is unreliable and very often is not in accord with present knowledge. Not infrequently, as in Corydalis, the number actually described is greater than that credited for the genus as a whole! Figures given appear not to have been checked against monographs and revision of the last 3-4 decades.

Nomenclatural errors are relatively few, when one considers the primitive conditions under which the work was edited, and that the editor was not a taxonomist nor did he have one on his staff. Several score could be listed, but to no gain at this time. Typographical errors occur infrequently, that under Heliophila, whose flowers are said to be in "long leafless rhizomes" is one of the more spectacular. Factual errors do occur, especially in some of the definitions [e.g., in those for carpel, carpophore, cortex, crossing, endemic, fertilization, and thyrse]. The biographical data are the most extensive known in any similar work, but those for botanists are not without error or balance. Gustave Beauverd died in 1942. C. B. Clarke is best known for his work on Cyperaceæ. Eichler was not a native of Baku, but a famous German botanist [who once did collect in Baku]. Prof. B. P. G. Hochreutiner, of Geneva, Switzerland, listed as having died in 1940, is still hale and hearty. Dr. George Hall [once of Bristol, R.I., and for whom Hall's honeysuckle was named] is cited as having lived in China. Japan, where he was a consular official, would have been more correct. James E. Dandy, a staff member at the near-by British Museum, is listed as having the Christian name of John. In several

places [sub Aster Frikartii, celery, Pelargonium, sweet peas, et al.] reference is made to a supplement yet to be published.

The common names are more complete than in any American work [most of those of Standardized Plant Names can make no claim to commoness], and the great majority is in accord with usage here. There are exceptions: Rose of Sharon is used for Hypericum calycinum [here for Hibiscus syriacus], the name Tung nut or oil [for Aleurites Fordii] does not appear, the species is called "China wood-oil tree." The Royal poinciana [Delonix regia, but retained in the genus Poinsiana by Chittenden] is called the Flamboyant Tree, a name common throughout the British West Indies. Spathodea campanulata, known throughout English-speaking tropics and subtropics as African Tulip-tree, is given no common name.

The cultural articles naturally are for British guidance. Those for subtropical plants are for glass-house culture. Tolerance limits for hardiness are not given but clearly are more broad than those for much of this country. Many of the directions on propagation and culture, especially of herbaceous material, can be studied profitably by the American gardener. Readers seeking up-to-date information on such subjects as irrigation, artificial illumination, turf culture and management, embryo-culture, or orchid culture, will be disappointed. The articles on culture will not be of significant aid to the American commercial florist or nurseryman.

This 4-volume dictionary is a "must" for the reference shelf of every horticultural institution, school, and library. If the reader keeps in mind the limitations inherent in the first two volumes, considers the superiority of the last, and makes use of their contents accordingly, it will be found to be a most useful source of information. The chief value of the work lies in the wide coverage of included plants. No other horticultural work in any language accounts for so many. Important also are the parenthetical references to illustrations of the plants described. These are to be found also in Rehder's "Manual" and in Bailey's "Standard Cyclopedia of Horticulture" but neither approaches Chittenden for scope or up-to-dateness. For reasons already given, the first two volumes cannot be relied on as reference sources for correct nomenclature. They should not be followed implicitly by catalogue writers, nurserymen, or horticultural writers.

It is to be hoped that the Royal Horticultural Society will soon publish a Supplement to include a list of corrigenda, giving the correct name (by modern taxonomic and nomenclatural standards) for the many plants in this work now bearing erroneous or questionable names. Such a Supplement will materially raise the inherent value of the dictionary as a whole. It is also hoped that the editor of this Supplement will include, under appropriate generic headings, bibliographic citations to the revisions and monographs dealing with cultivated species of those genera. This will compensate in part for the present out-datedness of many of these accounts and will help

to bring the quality of the first volumes closer to that of the last.

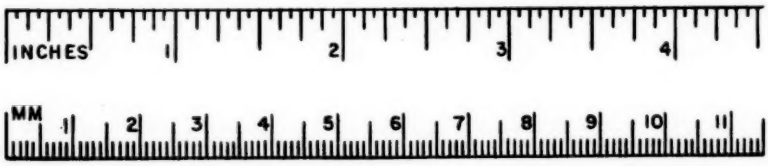
The appearance of this dictionary, and careful analysis of the handling of generic accounts between those of the first and those of the last volume, brings into sharp focus the change that has taken place in encyclopedic horticultural writings since the beginning of the present century. The day has gone when reliable and authentic horticultural accounts of the kinds of cultivated plants can be done by compilations from existing horticultural literature. Acceptable compilations can be made for genera covered by recent and competent botanical monographs and revisions. The use and adaptation requires, however, an appreciable degree of taxonomic competence on the part of the compiler. In addition, he must read French, German, and Latin with facility. Lacking these gems of literature, there rests with the person preparing the account the responsibility and need to study the plants about which he writes, to examine series of authentically named living plants or herbarium specimens on which to test reliability of selected key characters, to consult a variable number of recent floras or floristic works on regions where the species are native, and to check meticulously the nomenclature to be followed. This is time-consuming work but, as shown to a degree by many articles of volume 4 of the dictionary here reviewed, it is work replete with reward. The compilation of a dictionary of this scope requires the services of the best of minds, of specialists. It is pathetic to realize, in retrospect, that services of some of the greatest plant specialists in the world were close by the headquarters of the sponsoring organization, yet were passed by. Had they been utilized the articles on the ferns, orchids, grasses, tropical woody taxa, and others, the result might have been of a calibre to have made the work monumental. Most surely, the services of specialists in Crown service in Australia, New Zealand, South Africa, and Singapore could have been enlisted, but none is mentioned in the Preface. Horticulture has become a science, world-wide in scope. It is only reasonable that the alert horticulturist demands that the literature on the kinds of plants be as accurate as that on their physiology or pathology. One regrets that such demands are not met in the work here reviewed.

The Chittenden dictionary, for the great good that is in it, deserves to be well known by all horticulturists. Its cost, by American standards, is reasonable and none but the most miserly will deny that from within the covers of its volumes the perspicacious reader, student, and scholar will get manifold value received for the initial investment.

ABBREVIATIONS USED IN BAILEYA

[Excluding abbreviations of author names following binomials etc.]

ann.	annual	dm.	decimeter	lf.	leaf
bien.	biennial	fl.	flower	lft.	leaflet
br.	branch	fls.	flowers	lvs.	leaves
brt.	branchlet	flt.	floret	mm.	millimeter
caps.	capsule	fr.	fruit	per.	perennial
cl.	clone	ft.	foot	segm.	segment
cm.	centimeter	hort.	horticultural	st.	stem
cv.	cultivar	in.	inch	sts.	stems
diam.	diameter	infl.	inflorescence	var.	variety

METRIC - ENGLISH EQUIVALENTS (approximate)

6 mm. - 1/4 in.	10 cm. - 4 in.	10 mm. - 1 cm.
12 mm. - 1/2 in.	1 dm. - 4 in.	10 cm. - 1 dm.
25 mm. - 1 in.	3 dm. - 1 ft.	10 dm. - 1 meter
2.5 cm. - 1 in.	10 dm. - 1 yd.	
5 cm. - 2 in.	1 m. - 39 in.